Maastricht University

Nutrition tactics to improve post-exercise recovery

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Valorization

Relevance

The popularity of sports goes back to the first Olympic games 765 BC. More recently, it is estimated that the 2019 Super Bowl was watched by 98.2 million people [1]. But engagement in exercise and sports activities is also rising, with participation in the United states rising from ~15% in 2000 to 23% in 2016 [2]. Consistent with this growth, sports nutrition sales in the United States are increasing, with protein powder products having the largest market share with a total sales worth of $7.7 billion in 2016 [3]. Clearly, there is a high consumer interest in sports nutrition products.

Innovative applications

Sports nutrition research is of great value to both consumers and food producers. It allows consumers to make more informed decisions on sport nutrition product use and allows producers to make evidence-based products and claims. Research opens up the possibility to optimize current nutritional protocols and identify novel applications. For example, our lab has recently identified pre-sleep protein ingestion as a novel dietary strategy to augment the adaptive response to exercise training. However, in **chapter 5,** we have identified that pre-sleep protein ingestion is currently underused by athletes as an opportunity to consume a high protein meal. In addition, the combination of our earlier work [1] together with the research described in **chapter 7,** suggests that greater amounts of protein may need to be consumed prior to sleep compared to the ~20 g protein that is recommended for meals and/or as post-workout snack. This work opens up the opportunity for the food industry to make more tailored products for specific meal moments, by taking into account factors such as amount, type, matrix, and processing of the protein product. Moreover, the application of pre-sleep protein may extend beyond the athletic population. For example, we have recently observed that pre-sleep protein feeding can also improve overnight muscle anabolism in healthy older subjects [2]. This is an important finding, as it may represent a novel nutritional strategy to combat age-related muscle loss (sarcopenia), and begs the question if patients in more clinically compromised conditions characterized by accelerated muscle loss such as acute sickness, systemic inflammation, and muscle disuse, may also benefit from pre-sleep protein ingestion.

Another example of innovation is the application of sugar(s) in sports nutrition. Whereas the advice to the general public is to have a moderate sugar intake, this does not necessarily apply to athletes. For example, the intake of carbohydrate-rich sports drinks can help athletes to maintain energy balance during extreme exercise conditions such as the Tour the France [3]. In fact, much research is now focusing on the amount and composition of sports nutrition drinks to maximize carbohydrate availability during and following exercise. In **chapters 2 and 4**, we have demonstrated that sucrose feeding is an effective strategy to maximize carbohydrate availability during exercise and help restore muscle energy stores after exercise. This discrepancy between carbohydrate recommendations for athletes and the general public highlights the need for personalized nutritional advice and sports specific products.

Basic sports nutrition research usually entails the study of certain nutritional concepts in a young, healthy, very homogenous population. Yet, the findings can provide very relevant information for a range of different applications: 1) elite sports, since most invasive or long-term work is not done in actual elite athletes, 2) general recreational sports for 'health maintenance and/or improving physical performance for the individual, 3) ageing, see the previously described translation of the application

of pre-sleep protein from the athletic to the older population, and 4) clinical populations, in which only limited research is possible and ideally not performed unless there's substantial indication the interventions are safe and of potential benefit.

Knowledge dissemination

The findings from the research in this thesis have already been disseminated in different ways to educate and advice. Of course, the findings have been presented in scientific publications and at scientific conferences. In addition, the knowledge has been incorporated in several educational programs offered at Maastricht University, a course on Fontys and HAN University of Applied Sciences, a Belgium sport Dietetics course and a course on sports nutrition for sports physicians. Furthermore, an exciting aspect of sports nutritional research is the large interest of the public. For example, my Instagram account that exclusively shares evidence-based nutrition and exercise content currently has over 18.000 followers. I frequently get invited on podcasts to discuss my research. For example, two interviews on the Youtube channel Jeff Nippard together got over 276.000 views. These novel ways of knowledge dissemination and communicating with the public allow researchers to influence the public interpretation of their research. This has advantages for everyone involved:

- researchers: as the academic field is quite demanding, it can be very rewarding to see so much interest in your work.
- public: get information straight from the ''horse's mouth'', instead of the sometimes-misleading headlines and conclusions written by the media.
- funding partners: it shows that the funded work has clear interest from the general public

The research in this thesis has also been partly funded by industry partners. This highlights the interest of the food industry in sports nutrition research. Several of the nutritional strategies investigated in this thesis may lead to the development of specific products. For example, the high carbohydrate intakes investigated during and after exercise would not be feasible with whole-food items and require specifically designed sports nutrition products. Likewise, the ingestion of pre-sleep protein may be more practical in the form of a specific product that is ready to consume and in a concentrated form such as a protein bar or drink.

Personal perspective

An argument can be made that it's the obligation of a researcher to provide a well-balanced and correct knowledge transfer. While there is more information available for the public than ever, this coincides with more discussion on what the right information is and the rapid rise and use of the term 'fake news'. There is clearly a need from the public to have access to true experts that communicate with the public in more lay-terms. There is also increasing awareness among researchers that communication to the public is necessary to combat misinformation [4]. But the high current workload and competitive nature of academia make it unlikely that many researchers will allocate time for such matters if they do not believe it is recognized as "career capital". However, the use of social media is correlated with greater citation scores [5]. This may suggest that at least some social media use might be worthwhile. Furthermore, journals appear to increasingly value social media metrics and start displaying such metrics for each paper. I would not be surprised if such metrics may become even more relevant in the future, similar to traditional metrics such as the impact factor of a journal and a citation score of a paper. Journal editors may take the metrics of authors into account when

considering a paper as candidate for publication. Therefore, I expect knowledge dissemination (e.g. via a social media presence) will become the norm in the future.

Concluding remarks

The studies described in this thesis have allowed for a further optimization of carbohydrate and protein supplementation strategies to improve exercise recovery. In addition, the observed suboptimal protein distribution in well-trained Dutch athletes indicates there is still room for improvement in translating research to practice.

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